

## Ecological site F096XA013MI Snowy Wet Floodplain

Last updated: 10/03/2019  
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### General information

**Provisional.** A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

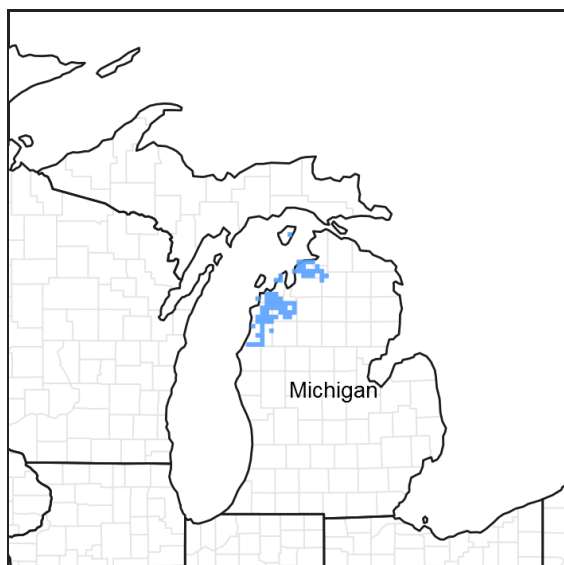


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

### MLRA notes

Major Land Resource Area (MLRA): 096X–Northwestern Michigan Fruit Belt

This area is dominated by outwash plains and moraines. Lake plains, till plains, drumlins, and sand dunes are found locally across the area. The terrain is steep on stream carved moraines, ice contact ridges, and sand dunes, and flat on outwash plains and lake plains. Elevation ranges from 177 to 369 m (580 to 1210 ft). Local topographic relief averages 11 m (35 ft) in the south to 20 m (65 ft) in the north and ranges up to a maximum of 158 m (520 ft) at Empire Bluff (Sleeping Bear Dunes). Much of the area rises sharply from the lakeshore to the adjoining hilltops. The Manistee River is the longest river in this area. Its trout fishery is maintained by constant inflow of cool ground water from the porous sand dominated landscape. The Pine and Pere Marquette Rivers also occur in this MLRA. Surficial topography are formed of glacial deposits except for local areas with dune building near Lake Michigan. Most of the bedrock surface is at or below the elevation of Lake Michigan, and is exposed in only in limited extents near Charlevoix. The bedrock, all Paleozoic in age, is the Traverse Group and the Dundee Limestone. These Silurian-Devonian rocks are mostly limestone and dolomite with some interbedded shale, chert, and anhydrite stringers. The drumlin belts in the northern portion of the area is the most affected by the limestone nearer to the surface in terms of carbonates in the till.

About two-thirds of this area is in small, privately owned holdings, and one-third consists mostly of State forests. The forests are used mainly for timber production and recreation. The growth of orchard crops and other crops and dairy and beef operations are important enterprises in the area. Forage and feed grains for dairy and other livestock

are the principal crops. Asparagus, wheat, oats, corn, and hay are commonly grown in the area. Orchard products include sweet and tart cherries, apples, plums, and peaches. The Manistee National Forest and Sleeping Bear Dunes National Lakeshore are among the more notable conservation lands in the area. Nordhouse Dunes Wilderness Area is within the Manistee National Forest. Sections of the Pere Marquette, Pine, and Manistee Rivers, and Bear Creek have been designated as National Wild and Scenic Rivers.

Summary of existing land use:

Upland Forest (47%)

Hardwood (38%)

Conifer (7%)

Developed (16%)

Swamps and Marshes (12%)

Agricultural (10%)

Open Water (8%)

Grassland (6%)

## Classification relationships

According to the USFS (Bailey) system of ecoregions, the site is located mostly within 212Hd (Grand Traverse Ground Moraine) and 212Hf (Grand Traverse Drumlin Fields) subsections. According to the EPA (Omernik) system of ecoregions, the site is located in 51m (Manistee-Leelanau Shore) and 51n (Platte River Outwash) level IV ecoregions. This site concept is outside the range of the USFS Ecological Land Type classification and the Kotar system.

## Ecological site concept

The central concept of Snowy Wet Floodplain is lowlands adjacent to a river or stream, periodically flooded, sometimes of long duration during the growing season or with a high watertable, and capable of supporting hydric vegetation (poorly drained or wetter). on Site is in the heavy annual snowfall belt, mostly north of Manistee River, where fire was rare. Area with a more northern flora than sites further south. Vegetation trending towards floodplain forest.

**Table 1. Dominant plant species**

Tree	(1) <i>Populus balsamifera</i> (2) <i>Thuja occidentalis</i>
Shrub	(1) <i>Cornus sericea</i>
Herbaceous	(1) <i>Matteuccia struthiopteris</i>

## Physiographic features

Site is located on floodplains eroded through glacial till or outwash.

**Table 2. Representative physiographic features**

Landforms	(1) Flood plain
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## Climatic features

Mean annual temperatures are 7.1 to 8.0 °C (45 to 46 °F). The warmest six months average 15.3 to 16.2 °C (60 to 61 °F). Mean July temperatures range from 19.8 to 20.7 °C (68 to 69 °F). Mean January temperatures range from -6.7 to -4.2 °C (20 to 24 °F). The maximum monthly average daily highs are 24.2 to 27.4 °C (76 to 81 °F). The minimum monthly average daily lows are -10.8 to -7.2 °C (13 to 19 °F). Mean annual precipitation ranges from 780 to 880 mm (31 to 35 in). Prevailing winds pick up moisture from the Great Lakes in the form of lake effect rain and snow showers during fall and winter seasons, and in the form of fog during spring and summer. Thunderstorm intensity is reduced by temperature inversions over the lake during the spring and early summer when lake water is cools the air flowing over it. Average 0 °C (32 °F) frost-free season ranges from 108 to 161 days. Average -2 °C (28

°F) freeze-free season is 141 to 194 days increasing in length from north to south and decreasing in length from the lakeshore inward. Mean annual snowfall ranges from 2.1 to 3.4 m (60 to 130 in). Mean annual extreme minimum temperatures range from -29 to -18.9 °C (-20 to -2 °F), or hardiness zones 4b to 6b.

**Table 3. Representative climatic features**

Frost-free period (average)	122 days
Freeze-free period (average)	155 days
Precipitation total (average)	864 mm

## Climate stations used

- (1) CHARLEVOIX [USC00201468], Charlevoix, MI
- (2) NW MICHIGAN RSCH FM [USC00206012], Suttons Bay, MI
- (3) MAPLE CITY 1E [USC00205097], Cedar, MI
- (4) FRANKFORT 2NE [USC00202984], Frankfort, MI
- (5) NORTHPORT 2W [USC00206007], Northport, MI
- (6) PETOSKEY [USC00206507], Petoskey, MI
- (7) TRAVERSE CITY CHERRY CPTL AP [USW00014850], Traverse City, MI

## Influencing water features

Site subject to seasonal flooding during the growing season, at long enough duration to exclude flood sensitive species. Seasonal high water table generally within the depth of a majority of roots, less that 25 cm.

## Soil features

Soils are very poorly drained to poorly drained variable textures that are seasonally flooded. They are commonly classified Mollic Psammaquents, Fluvaquentic Endoaquolls, and Typic Haplosaprists, and commonly mapped as Glendora, Gorvan, and Houghton series or components. The top 50 cm has a typical pH of 6.8 and is 40% sand and 29.1% organic matter. At depth, pH ranges up to 7.1, and texture averages 55% sand and 15% clay. Depth to impeded hydraulic conductivity or root restrictive layers averages >200 cm. Depth to carbonates averages 170 cm.

## Ecological dynamics

Snowy Wet Floodplain tends to share the same ecological dynamics as Natureserve/Landfire system, Laurentian-Acadian Floodplain. Stand replacing fires were very rare, with light surface fires occurring every 1000-4000 years. Frequent flooding may transport nutrients and enhance vegetation growth. Severe flooding may occasionally uproot trees and create canopy openings. Overstory was dominated by flood tolerant species like poplar (*Populus* spp.) and willow (*Salix* spp.) in flood scoured areas, and whitecedar (*Thuja occidentalis*) in stable areas with groundwater flow. The wet, relatively high base soils support a productive understory that tolerates periodic inundation. common species include the thicket forming red-osier dogwood (*Cornus sericea*) and the ostrich fern (*Matteuccia struthiopteris*).

## State and transition model

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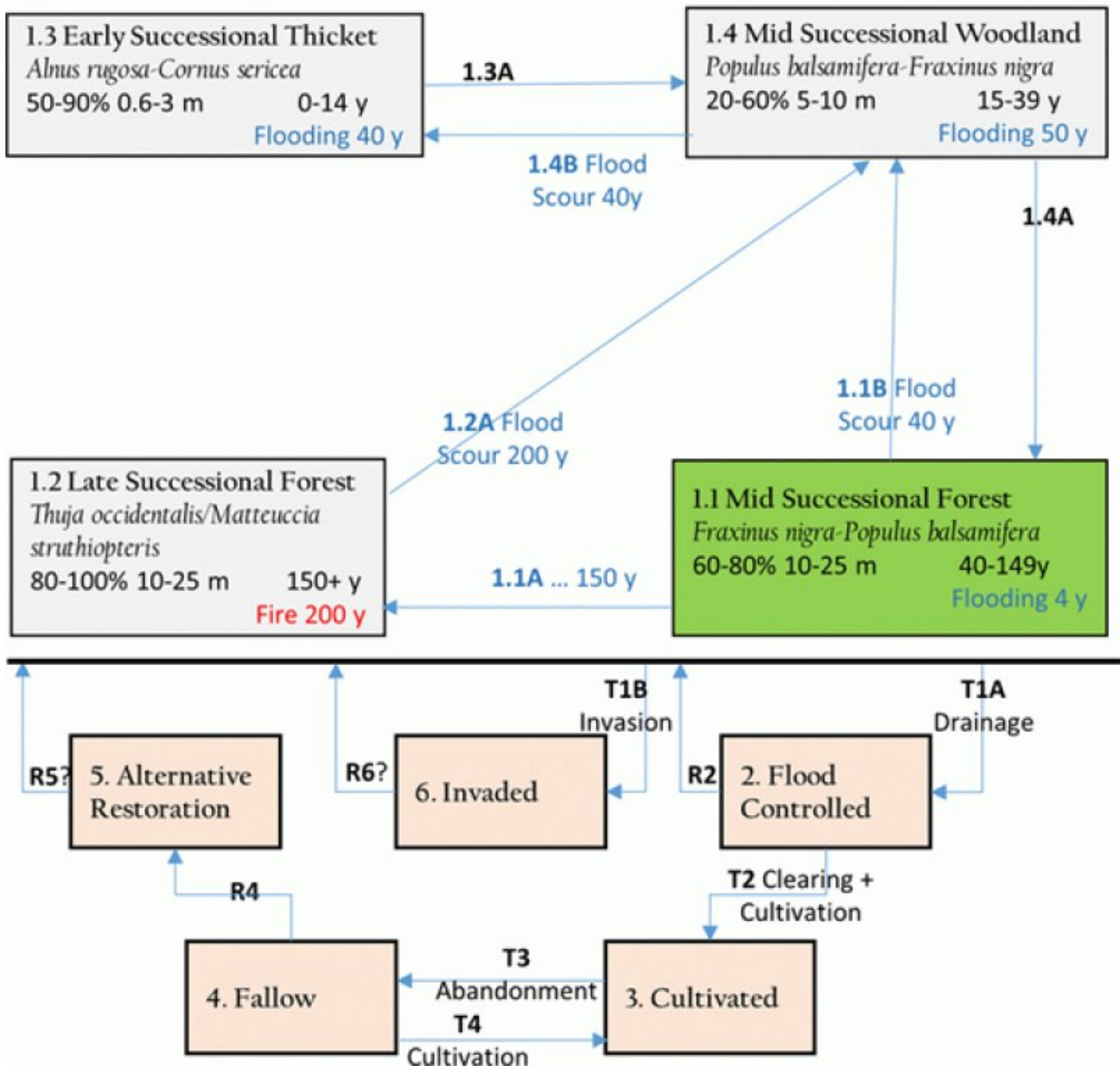


Figure 6. stm

## Legend

1.1A	No disturbance for 150 years
1.1B	Flood scouring every 40 years
1.2A	Flood scouring every 200 years
1.3A	Succession
1.4A	Succession
1.4B	Flood scouring every 40 years
R2	Restoration
R4	Restoration
R5	Restoration?
R6	Restoration?
T1A	Flood controlled
T1B	Invasive species introduction
T2	Clearing + cultivation of crops
T3	Abandonment + invasive species
T4	Cultivation

Figure 7. Legend

### State 1

#### Reference State

#### Community 1.1

Floodplain Forest: *Acer saccharinum* - *Ulmus americana* / *Onoclea sensibilis* Floodplain Forest

#### Community 1.2

Wet Meadow

#### Community 1.3

Shrub-Thicket

#### Community 1.4

Emergent Marsh

#### Community 1.5

Inundated Shrub Swamp

#### Pathway 1.1A

Community 1.1 to 1.2

Temporary prolonged inundation.

#### Pathway 1.1B

Community 1.1 to 1.3

Clearcut/Blowdown.

**Conservation practices**

Early Successional Habitat Development/Management
Forest Stand Improvement

**Pathway 1.2A**

**Community 1.2 to 1.1**

Succession.

**Conservation practices**

Tree/Shrub Site Preparation
Tree/Shrub Establishment

**Pathway 1.2B**

**Community 1.2 to 1.3**

Succession.

**Conservation practices**

Tree/Shrub Site Preparation
Tree/Shrub Establishment

**Pathway 1.2D**

**Community 1.2 to 1.4**

Permanent inundation.

**Pathway 1.2E**

**Community 1.2 to 1.5**

Shrub establishment; permanent inundation.

**Conservation practices**

Tree/Shrub Establishment
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**Pathway 1.3A**

**Community 1.3 to 1.1**

Succession.

**Conservation practices**

Tree/Shrub Site Preparation
Tree/Shrub Establishment

**Pathway 1.3B**

**Community 1.3 to 1.2**

Temporary prolonged inundation.

**Pathway 1.3C**  
**Community 1.3 to 1.4**

Permanent inundation.

**Pathway 1.3C**  
**Community 1.3 to 1.5**

Permanent inundation.

**Pathway 1.4A**  
**Community 1.4 to 1.2**

Drop water table.

**Pathway 1.4C**  
**Community 1.4 to 1.5**

Temporary drop water table; shrub establishment.

**Pathway 1.5A**  
**Community 1.5 to 1.2**

Drop water table; shrub mortality.

**Conservation practices**

Brush Management
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**Pathway 1.5C**  
**Community 1.5 to 1.4**

Temporary drought; shrub mortality.

**State 2**  
**Cultural State**

**Community 2.1**  
**Sustainable Crop, Pasture, or Plantation**

**Community 2.2**  
**Unsustainable Cultural Phase**

**Community 2.3**  
**Conservation Feature**

Can be a grassed waterway, conservation reserve, a small patch pollinator garden, or other land taken out of its primary cultural production to mitigate or reduce impacts of adjacent land use, and is not by itself a permanent restoration of a complete native biological community and associated ecosystem services.

**Pathway 2.1A**  
**Community 2.1 to 2.2**

Revert to unsustainable cultural practices.

**Pathway 2.1B**  
**Community 2.1 to 2.3**

Establish conservation feature.

**Conservation practices**

Conservation Cover
Grassed Waterway

**Pathway 2.2A**  
**Community 2.2 to 2.1**

Implement sustainable cultural practices.

**Conservation practices**

Conservation Crop Rotation
Cover Crop
Nutrient Management
Integrated Pest Management (IPM)

**Pathway 2.2B**  
**Community 2.2 to 2.3**

Establish conservation feature.

**Conservation practices**

Conservation Cover
Grassed Waterway

**Pathway 2.3A**  
**Community 2.3 to 2.1**

Implement sustainable cultural practices.

**Conservation practices**

Conservation Crop Rotation
Cover Crop
Nutrient Management
Integrated Pest Management (IPM)

**Pathway 2.3B**  
**Community 2.3 to 2.2**

Revert to unsustainable cultural practices.

**State 3**  
**Seminatural Drained State**

**Community 3.1**



## **Ruderal Drained Meadow & Shrub**

### **Community 3.2**

#### **Exotic Ruderal Drained Forest**

#### **Pathway 3.1A**

##### **Community 3.1 to 3.2**

Succession

#### **Pathway 3.2A**

##### **Community 3.2 to 3.1**

Blowdown/clearcut.

#### **Conservation practices**

Early Successional Habitat Development/Management
Forest Stand Improvement

## **State 4**

### **Seminatural State**

#### **Community 4.1**

##### **Ruderal Wet Meadow & Shrub Swamp**

#### **Community 4.2**

##### **Exotic Ruderal Swamp Forest**

#### **Pathway 4.1A**

##### **Community 4.1 to 4.2**

Succession.

#### **Pathway 4.2A**

##### **Community 4.2 to 4.1**

Blowdown/clearcut.

#### **Conservation practices**

Early Successional Habitat Development/Management
Forest Stand Improvement

## **Transition T1A**

### **State 1 to 2**

Drain; clear vegetation; cultivate domesticated species.

## **Transition T1B**

### **State 1 to 3**

Drain; clear vegetation, invasive species introduced.

## **Transition T1C**

## State 1 to 4

Clear vegetation, invasive species introduced.

## Restoration pathway R2

### State 2 to 1

Restore hydrology; remove domesticated species; restore native species.

#### Conservation practices

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Wetland Restoration
Herbaceous Weed Control

## Transition T2A

### State 2 to 3

Abandon, succession.

## Transition T2B

### State 2 to 4

Restore hydrology; abandon; succession.

#### Conservation practices

Wetland Restoration
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## Restoration pathway R3

### State 3 to 1

Restore hydrology; control invasive species; restore native species

#### Conservation practices

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Wetland Restoration
Herbaceous Weed Control

## Transition T3A

### State 3 to 2

Clear vegetation; cultivate domesticated species.

## Transition T3B

### State 3 to 4

Restore hydrology.

#### Conservation practices

## Restoration pathway R4 State 4 to 1

Control invasive species; restore native species.

### Conservation practices

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Herbaceous Weed Control

## Transition T4A State 4 to 2

Drain; clear vegetation; cultivate domesticated species.

## Transition T4B State 4 to 3

Drain.

## Additional community tables

### Other references

A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a major land resource area (MLRA) based on the similarities in response to management. A provisional ecological site is a first approximation based on a cursory literature review, personal experience, and limited field reconnaissance. As more adequate literature review, expert opinion, and intensive plot data are collected, the site concept is subject to shifting, broadening, narrowing, subdivision, or re-aggregation in definition. Likewise, the community dynamics will be more elaborate in content, and may also change in structure, upon reaching approved status.

Future work, as described in a project plan, to validate the information in this provisional ecological site description is needed. This will include field activities to collect low and medium intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the project plan are to be conducted by the Ecological Site Technical Team.

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## Contributors

Gregory J. Schmidt

## Approval

Nels Barrett, 10/03/2019

## Acknowledgments

The following individuals made substantive comments regarding the development of the Provisional Ecological Sites: Randy Swaty, The Nature Conservancy; Trevor Hobbs, USFS; Richard A. Corner, USFS; Andy Henriksen, NRCS; Dan Zay, NRCS.

## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
- 

14. **Average percent litter cover (%) and depth ( in):**
- 

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
- 

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**
- 

17. **Perennial plant reproductive capability:**
-